

| | Year 12 | Year 13 |
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| <p>Autumn half term 1 Sequential knowledge and skills</p> | <p>Foundations for Biology <i>GCSE Prior Understanding: GCSE 4.1</i> From GCSE students should understand that cells are the basic unit of all forms of life. In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells.</p> <p><u>Microscopy and Cell Structure</u> Biology is the study of living organisms. Every living organism is made up of one or more cells, therefore understanding the structure and function of the cell is a fundamental concept in the study of biology. Since Robert Hooke coined the phrase ‘cells’ in 1665, careful observation using microscopes has revealed details of cell structure and ultrastructure and provided evidence to support hypotheses regarding the roles of cells and their organelles. <i>A-Level Links: All subsequent units link back to the topic of cells and cell structure, it is a foundation of biological understanding.</i> <i>GCSE Links: Unit 1 – Cell structure</i> <u>Cell Surface Membranes</u> Membranes are fundamental to the cell theory. The structure of the plasma membrane allows cells to communicate with each other. Understanding this ability to communicate is important as scientists increasingly make use of membrane-bound receptors as sites for the action of medicinal drugs. Understanding how different substances enter cells is also crucial to the development of mechanisms for the administration of drugs. <i>A-Level Links: Neurones, Respiration and Photosynthesis</i> <i>GCSE Links: Unit 1 – Cell structure</i> <u>Biological Molecules</u> Biological molecules. Proteins, carbohydrates and lipids are three of the key groups of biological macromolecules that are essential for life. A study of the structure of these macromolecules allows a better understanding of their functions in living organisms. <i>A-Level Links: Respiration, Photosynthesis, Enzymes and the Liver</i></p> | <p>Communication and Homeostasis <i>GCSE Prior Understanding: GCSE 4.5</i> At GCSE students understand that cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes.</p> <p><u>Neuronal Communication</u> Organisms use both chemical and electrical systems to monitor and respond to any deviation from the body’s steady state. The stimulation of sensory receptors leads to the generation of an action potential in a neurone. Transmission between neurones takes place at synapses. <i>A-Level Links: Plasma Membranes, Cell Structure, Movement of Molecules.</i> <i>GCSE Links: Unit 5 – The Nervous System</i> <u>Hormonal Communication</u> The ways in which specific hormones bring about their effects are used to exemplify endocrine communication and control. Treatment of diabetes is used as an example of the use of medical technology in overcoming defects in hormonal control systems. <i>A-Level Links: Plasma Membranes, Magnification</i> <i>GCSE Links: Unit 5 – Homeostasis and Response</i> <u>Homeostasis</u> The kidneys, liver and lungs are all involved in the removal of toxic products of metabolism from the blood and therefore contribute to homeostasis. The kidneys play a major role in the control of the water potential of the blood. The liver also metabolises some toxins that are ingested. <i>A-Level Links: Biological Molecules, Transport in the Blood, Diffusion and Plasma Membranes</i> <i>GCSE Links: Unit 5 – Homeostasis and Response</i></p> |

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| | <p>GCSE Links: Unit 2 – Food Groups and Digestion</p> | |
| <p>Assessment Content and methods used to judge learning</p> | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid</i></p> <ul style="list-style-type: none"> • End of topic consolidation tasks • Peer marked end of topic assessment • Leveled practical write up • Required Practical completion • Y12 Assessment 1 & 2 - September & October | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants, Enzymes, Biological Molecules, Classification and Evolution, Biodiversity, Communicable Disease, Populations and Sustainability, Plant Responses, Ecosystems, Neuronal Communication, Hormonal Communication, Homeostasis</i></p> <ul style="list-style-type: none"> • End of topic consolidation tasks • Peer marked end of topic assessment • Leveled practical write up • Required Practical completion • Y13 Assessment 1 & 2 - September & October |
| <p>Autumn half term 2 Sequential knowledge and skills</p> | <p>Cell Division During the cell cycle, genetic information is copied and passed to daughter cells. Microscopes can be used to view the different stages of the cycle. In multicellular organisms, stem cells are modified to produce many different types of specialised cell. Understanding how stem cells can be modified has huge potential in medicine. To understand how a whole organism functions, it is essential to appreciate the importance of cooperation between cells, tissues, organs and organ systems.</p> <p>A-Level Links: Genetics GCSE Links: Unit 6 – Meiosis</p> <p>Enzymes Metabolism in living organisms relies upon enzyme controlled reactions. Knowledge of how enzymes function and the factors that affect enzyme action has improved our understanding of biological processes and increased our use of enzymes in industry.</p> <p>A-Level Links: Respiration, Photosynthesis and the Liver GCSE Links: Unit 2 – Food Groups and Digestion</p> <p>DNA Nucleic acids are essential to heredity in living organisms. Understanding the structure of nucleotides and nucleic acids allows an understanding of their roles in the storage and use of genetic information and cell metabolism.</p> <p>A-Level Links: Genetics and Biological Molecules GCSE Links: Unit 6 – DNA and Genetics</p> | <p>Bioenergetics GCSE Prior Understanding: GCSE 4.4 Previously students will have understood how plants harness the Sun's energy in photosynthesis in order to make food. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere. Both animals and plants use this oxygen to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue.</p> <p>Photosynthesis Photosynthesis is the process whereby light from the Sun is harvested and used to drive the production of chemicals, including ATP, and used to synthesise large organic molecules from inorganic molecules. The structure of a chloroplast and the sites of the two main stages of photosynthesis. The components of a chloroplast including outer membrane, lamellae, grana, thylakoid, stroma and DNA. The importance of photosynthetic pigments in photosynthesis practical investigations using thin layer chromatography (TLC) to separate photosynthetic pigments To include reference to light harvesting systems and photosystems.</p> <p>A-Level Links: Plant Transport, Plasma Membranes and Cell Structure. Biological molecules (thin layer chromatography) GCSE Links: Unit 4 – Photosynthesis</p> <p>Respiration Respiration is the process whereby energy stored in complex organic molecules is transferred to ATP. ATP provides the immediate source of energy for biological processes.</p> |

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| | | <p>The need for cellular respiration. To include examples of why plants, animals and microorganisms need to respire (suitable examples could include active transport and an outline of named metabolic reactions).</p> <p>The structure of the mitochondrion The components of a mitochondrion including inner and outer mitochondrial membranes, cristae, matrix and mitochondrial DNA.</p> <p>A-Level Links: Plasma Membranes and Cell Structure. Biological molecules (respiratory substrates)</p> <p>GCSE Links: Unit 4 – Respiration</p> |
| <p>Assessment Content and methods used to judge learning</p> | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants</i></p> <ul style="list-style-type: none"> • End of topic consolidation tasks • Peer marked end of topic assessment • Leveled practical write up • Required Practical completion • Y12 Assessment 3 - November | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants, Enzymes, Biological Molecules, Classification and Evolution, Biodiversity, Communicable Disease, Populations and Sustainability, Plant Responses, Ecosystems, Neuronal Communication, Hormonal Communication, Homeostasis, Photosynthesis, Respiration</i></p> <ul style="list-style-type: none"> • End of topic consolidation tasks • Peer marked end of topic assessment • Leveled practical write up • Required Practical completion • Y13 Assessment 3 - November |
| <p>Spring half term 3 Sequential knowledge and skills</p> | <p>Organisation and Systems GCSE Prior Understanding: GCSE 4.2 <i>The focus of the learning at GCSE was on the respiratory system and the understanding that it provides us with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. We will also learn how the plant’s transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis.</i></p> <p>Lungs As animals become larger and more active, ventilation and gas exchange systems become essential to supply oxygen to, and remove carbon dioxide from, their bodies. Ventilation and gas exchange systems in mammals, bony fish and insects are used as examples of the properties and functions of exchange surfaces in animals.</p> <p>A-Level Links: Plasma Membranes and Diffusion. Respiration and Transport of Molecules in the Blood.</p> <p>GCSE Links: Unit 2 – Gas Exchange</p> | <p>Genetics GCSE Prior Understanding: GCSE 4.6 <i>Here students should know that gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and consequently, lead to increased fitness in the individual. Once new varieties of plants or animals have been produced it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic. Scientists have now discovered how to take genes from one species and introduce them in to the genome of another by a process called genetic engineering. In spite of the huge potential benefits that this technology can offer, genetic modification still remains highly controversial.</i></p> <p>Cloning and Biotechnology Farmers and growers exploit “natural” vegetative propagation in the production of uniform crops. Artificial clones of plants and animals can now be produced. Biotechnology is the industrial use of living organisms (or parts of living organisms) to produce food, drugs or other product.</p> <p>A-Level Links: DNA and Biological Molecules. Ethics.</p> <p>GCSE Links: Unit 6 – Genetics</p> <p>Genetics of Living Systems The way in which cells control metabolic reactions determines how organisms, grow, develop and function.</p> <p>A-Level Links: DNA and Biological Molecules. Ethics.</p> <p>GCSE Links: Unit 6 – Genetics</p> <p>Inheritance</p> |

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| | <p>Heart and Fluid As animals become larger and more active, transport systems become essential to supply nutrients to, and remove waste from, individual cells. Controlling the supply of nutrients and removal of waste requires the coordinated activity of the heart and circulatory system. A-Level Links: Plasma Membranes and Neurones. Respiration and Transport of Molecules in the Blood. GCSE Links: Unit 2 – Circulation</p> <p>Plants As plants become larger and more complex, transport systems become essential to supply nutrients to, and remove waste from, individual cells. The supply of nutrients from the soil relies upon the flow of water through a vascular system, as does the movement of the products of photosynthesis. A-Level Links: Photosynthesis and Microscopy. GCSE Links: Unit 2 – Plant Organisation</p> | <p>Isolating mechanisms can lead to the accumulation of different genetic information in populations, potentially leading to new species. Over a prolonged period of time, organisms have changed and some have become extinct. The theory of evolution explains these changes. Humans use artificial selection to produce similar changes in plants and animals. A-Level Links: DNA, Evolution and Biological Molecules. GCSE Links: Unit 6 – Genetics</p> <p>Genomes Genome sequencing gives information about the location of genes and provides evidence for the evolutionary links between organisms. Genetic engineering involves the manipulation of naturally occurring processes and enzymes. The capacity to manipulate genes has many potential benefits, but the implications of genetic techniques are subject to much public debate A-Level Links: DNA, Evolution and Biological Molecules. GCSE Links: Unit 6 – Genetics</p> |
| <p>Assessment Content and methods used to judge learning</p> | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants, Enzymes, Biological Molecules, Classification and Evolution</i></p> <ul style="list-style-type: none"> • End of topic consolidation tasks • Peer marked end of topic assessment • Leveled practical write up • Required Practical completion • Y12 Assessment 4 & 5 – Winter Mock & February | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants, Enzymes, Biological Molecules, Classification and Evolution, Biodiversity, Communicable Disease, Populations and Sustainability, Plant Responses, Ecosystems, Neuronal Communication, Hormonal Communication, Homeostasis, Photosynthesis, Respiration, Cloning and Biotechnology, Genetics of Living Systems, Inheritance, Genomes</i></p> <ul style="list-style-type: none"> • End of topic consolidation tasks • Peer marked end of topic assessment • Leveled practical write up • Required Practical completion • Y13 Assessment 4 & 5 – Winter Mock & February |
| <p>Spring half term 4 Sequential knowledge and skills</p> | <p>Biodiversity GCSE Prior Understanding: GCSE 4.7 Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Classification and Evolution Evolution has generated a very wide variety of organisms. The fact that all organisms share a common ancestry allows them to be classified. Classification is an attempt to impose a hierarchy on the complex and dynamic variety of life on Earth. Classification systems have changed and will continue to change as our knowledge of the biology of organisms develops. A-Level Links: DNA and Evolution</p> | <p>Revision</p> <ul style="list-style-type: none"> • End Of Topic Consolidation Tasks • Peer Marked End Of Topic Assessment • Required Practical Completion • Review Of The Specification Checklist • Practice Papers • Modelling Written Answers |

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| | <p>GCSE Links: Unit 7 – Ecosystems Communicable Disease Organisms are surrounded by pathogens and have evolved defenses against them. Medical intervention can be used to support these natural defenses. The mammalian immune system is introduced. A-Level Links: Plasma Membranes, Cell Structure, Movement of Molecules. GCSE Links: Unit 3 – Infection and Response</p> | |
| <p>Assessment Content and methods used to judge learning</p> | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants, Enzymes, Biological Molecules, Classification and Evolution, Biodiversity, Communicable Disease</i></p> <ul style="list-style-type: none"> • End of topic consolidation tasks • Peer marked end of topic assessment • Leveled practical write up • Required Practical completion • Y12 Assessment 6 – March | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants, Enzymes, Biological Molecules, Classification and Evolution, Biodiversity, Communicable Disease, Populations and Sustainability, Plant Responses, Ecosystems, Neuronal Communication, Hormonal Communication, Homeostasis, Photosynthesis, Respiration, Cloning and Biotechnology, Genetics of Living Systems, Inheritance, Genomes</i></p> <ul style="list-style-type: none"> • End of topic consolidation tasks • Peer marked end of topic assessment • Leveled practical write up • Required Practical completion • Y13 Assessment 6 – Spring Mock |
| <p>Summer half term 5 Sequential knowledge and skills</p> | <p>Biodiversity 4.7 GCSE Prior Understanding: <i>Students are aware that the Sun is a source of energy that passes through ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development. In order to continue to benefit from these services humans need to engage with the environment in a sustainable way. In this section we will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider some actions we need to take to ensure our future health, prosperity and well-being.</i></p> <p>Biodiversity Biodiversity refers to the variety and complexity of life. It is an important indicator in the study of habitats. Maintaining biodiversity is important for many reasons. Actions to maintain biodiversity must be taken at local, national and global levels.</p> | <p>Revision</p> <ul style="list-style-type: none"> • End Of Topic Consolidation Tasks • Peer Marked End Of Topic Assessment • Required Practical Completion • Review Of The Specification Checklist • Practice Papers • Modelling Written Answers |

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| | <p>A-Level Links: Ethics and Ecosystems GCSE Links: Unit 7 – Ecosystems Populations and Sustainability There are many factors that determine the size of a population. For economic, social and ethical reasons ecosystems may need to be carefully managed. To support an increasing human population, we need to use biological resources in a sustainable way.</p> <p>A-Level Links: Population Growth – link to Bacterial cultures in Biotechnology GCSE Links: Unit 7 – Ecosystems Plant Responses Plant responses to environmental changes are coordinated by hormones, some of which are important commercially.</p> <p>A-Level Links: Photosynthesis and Plant Transport GCSE Links: Unit 2 – Plant Responses</p> | |
| <p><i>Assessment Content and methods used to judge learning</i></p> | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants, Enzymes, Biological Molecules, Classification and Evolution, Biodiversity, Communicable Disease, Populations and Sustainability, Plant Responses</i></p> <ul style="list-style-type: none"> • <i>End of topic consolidation tasks</i> • <i>Peer marked end of topic assessment</i> • <i>Leveled practical write up</i> • <i>Required Practical completion</i> • <i>Y12 Assessment 7 – April</i> | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants, Enzymes, Biological Molecules, Classification and Evolution, Biodiversity, Communicable Disease, Populations and Sustainability, Plant Responses, Ecosystems, Neuronal Communication, Hormonal Communication, Homeostasis, Photosynthesis, Respiration, Cloning and Biotechnology, Genetics of Living Systems, Inheritance, Genomes</i></p> <ul style="list-style-type: none"> • <i>End of topic consolidation tasks</i> • <i>Peer marked end of topic assessment</i> • <i>Leveled practical write up</i> • <i>Required Practical completion</i> • <i>Y13 Assessment 7 – Exam</i> |
| <p>Summer half term 6 Sequential knowledge and skills</p> | <p>Ecosystems Organisms do not live in isolation but engage in complex interactions, not just with other organisms but also with their environment. The efficiency of biomass transfer limits the number of organisms that can exist in a particular ecosystem. Ecosystems are dynamic and tend towards some form of climax community.</p> <p>A-Level Links: Maths skills and Biodiversity GCSE Links: Unit 7 – Ecosystems</p> | |
| <p><i>Assessment Content and methods used to judge learning</i> <i>Assessment</i></p> | <p><i>Microscopy and Cell Structure, Cell Surface Membranes, Lungs, Heart and Fluid, Cell Division, DNA, Plants, Enzymes, Biological Molecules, Classification and Evolution, Biodiversity, Communicable Disease, Populations and Sustainability, Plant Responses, Ecosystems</i></p> <ul style="list-style-type: none"> • <i>End of topic consolidation tasks</i> • <i>Peer marked end of topic assessment</i> • <i>Leveled practical write up</i> | |

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| | <ul style="list-style-type: none">• <i>Required Practical completion</i>• <i>Y12 Assessment 8 – Summer Mock</i> | |
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